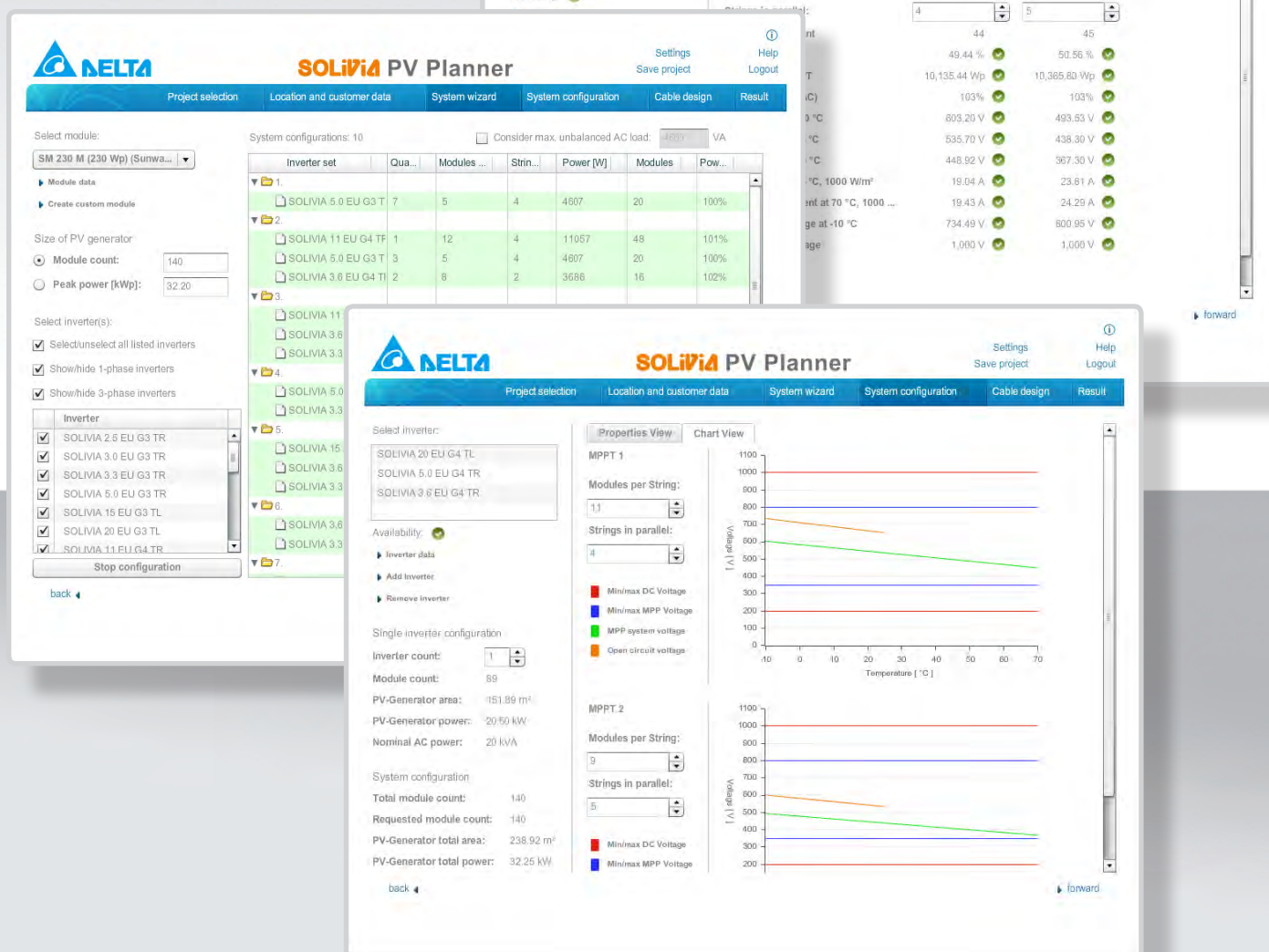




User manual

SOLiViA PV Planner



Terms and conditions

DELTA has reviewed SOLIVIA PV Planner for content and function. Nevertheless, SOLIVIA PV Planner is only an auxiliary tool for reviewing the dimensions of PV systems, and as such, can never replace the involvement of an expert in technical planning and reviewing the results. Within the framework of your use of SOLIVIA PV Planner, you are further obligated to critically assess the results of the SOLIVIA PV Planner. For these reasons, DELTA is not liable for material or intangible damage caused directly or indirectly by use of SOLIVIA PV Planner, provided DELTA was not at fault due to demonstrable willful intent or gross negligence.

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1. Introduction

The SOLIVIA PV Planner is a software tool for designing photovoltaic systems. In a few simple steps, modules, inverters and other components can be combined into a photovoltaic system.

This can either be carried out automatically using the system assistant or manually in the system configuration.

Comprehensive calculations for all essential technical criteria in a photovoltaic system help optimize configuration.

Integrated tool tips explain the calculated values and indicate when values have not yet reached the optimal range. This prevents bad planning that would consequently be a lot of hassle to correct in the actual system.

Project data regarding the configured photovoltaic system is all compiled into a detailed overview at the end.

This overview can be saved as a PDF and sent by e-mail. The data format XML allows project data to be exchanged easily with other PV planners and applications.

2. Installation

2.1 Versions

The PV Planner is available as an online and an offline version.

The only difference is that a constant Internet connection is required for the online version.

2.2 Online version

The online version runs directly in the Internet browser and requires a constant Internet connection. The online version can be tested without first registering with Delta and setting up a customer account. The test version has all functions of the full version. However, to save a project from the test version, registration is required.

2.2.1 System prerequisite online version

The following information presents the minimum requirements. The more powerful the computer is, the faster the software runs.

General system prerequisites

- Broadband Internet connection for the entire operating time of the application (firewall must allow Internet access).
- Installed Adobe Flash Player starting with version 10.2 (source: <http://get.adobe.com/de/flashplayer/>)
- Java script must be activated in the browser
- Cookies and flash player cache must be activated.

Windows

- 2.33 GHz or faster x86 compatible processor, Intel® Atom™ 1.6 GHz or faster processor for netbooks
- Microsoft® Windows® XP (32-bit), Windows Server® 2003 (32-bit), Windows Server 2008 (32-bit), Windows Vista® (32-bit), Windows 7 (32-bit und 64-bit), Windows guidelines should correspond to a standard installation.
- Internet Explorer 8.0 or higher, Mozilla Firefox 4.0 or higher, Google Chrome, Safari 5.0 or higher, Opera 11; installation with standard settings
- 1024 MB RAM, 128 MB graphics memory

Mac OS

- Intel Core™ Duo 1.33 GHz or faster processor
- Mac OS X v10.6 or v10.7
- Safari 5.0 or higher, Mozilla Firefox 4.0 or higher, Google Chrome, Opera 11; installation with standard settings
- 1024 MB RAM, 128 MB graphics memory

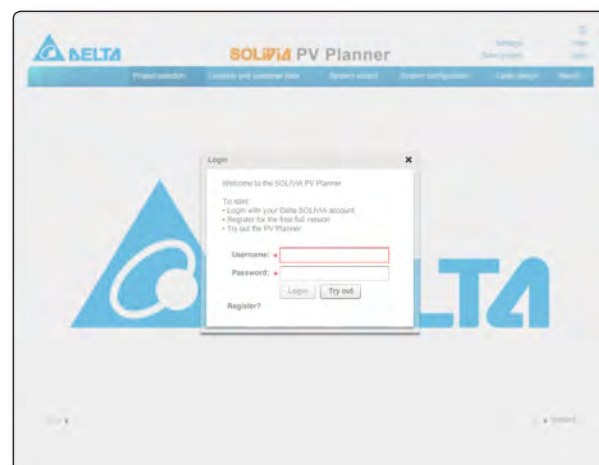
Linux specific

- 2.33 GHz or faster x86 compatible processor, Intel® Atom™ 1.6 GHz or faster processor for netbooks
- Red Hat® Enterprise Linux (RHEL) 5.6 or higher (32-bit and 64-bit), openSUSE® 11.3 or higher (32-bit and 64-bit), Ubuntu 10.04 or higher (32-bit and 64-bit)
- Mozilla Firefox 4.0 or Google Chrome; installation with standard settings
- 1024 MB RAM, 128 MB graphics memory

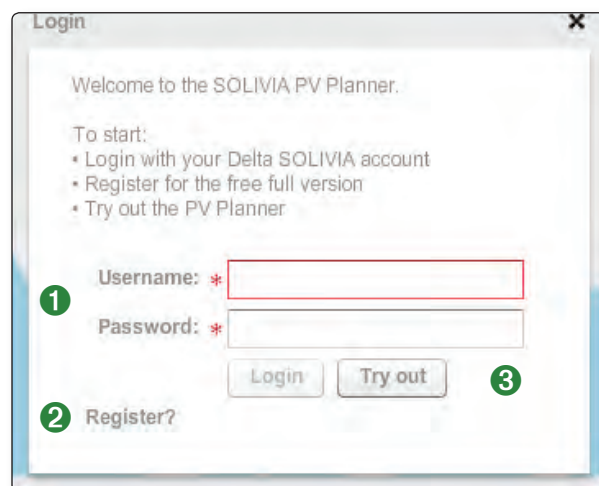
Open and start online version

1. Using your browser, open the website <http://pvplanner.solar-inverter.com/fileadmin/configurator/SolarCalculatorWeb.html>.

→ The PV Planner will start and the log-in window is displayed.



There are three options to continue.



- 1 If you have a customer account at Delta, log-in with your access data (user name and password). The user name is the email address that you entered during registration.
- 2 If you do not yet have a customer account with Delta, you can register (see “3. Registration”, p. 7) and then log-in to the PV Planner using the access data.
- 3 The PV Planner can be tested without prior registration and logging in. Click the **Try out** button to open the test version.

NOTE



- If you already have a customer account for the SOLIVIA monitoring, you can use this access data.

2. Installation

2.3 Offline version

The offline version does not require constant Internet connection. The Internet connection is only required during installation so that the data of the modules and inverters can be loaded.

New updates (modules, inverters, software settings) will be installed automatically. For the installation an Internet connection is needed.

Before downloading the offline version, registration with Delta and a setting up a customer account is necessary. It is not possible to test the PV planners without setting up a customer account with the offline version.

2.3.1 System requirements for the offline version

General system prerequisites

- The Adobe AIR runtime environment in Version 2.0 or newer must be installed (source: <http://get.adobe.com/de/air/>)
- Sufficient memory on the hard drive to download and install the application
- Internet connection is only required to update the data of the PV Planner.

Windows

- Pentium 4 with 2 GHz or faster processor
- Windows Vista® Home Premium, Business, Ultimate or Enterprise including 64-Bit-Editions; Windows Vista 1; Windows XP Tablet PC Edition SP2 and SP3; Windows XP SP2 and SP3; Windows Server 2003/2008; Windows 7; Windows guidelines must always correspond to a standard installation.
- 1 GB RAM working memory

Mac OS

- Intel Core™ Duo 1.83 GHz or faster processor
- Mac OS 10.5 or Mac OS 10.6
- 1 GB RAM working memory

Linux

- Pentium 4 with 2 GHz or faster processor
- Fedora Core 12, Ubuntu 9.10, openSUSE 11.2.
- 1 GB RAM working memory
- Supported desk top environments: GNOME and KDE
- Package management systems: RPM and Debian
- Minimum version from GTK+: 2.6
- Windows manager: Metacity (Standard for GNOME) and KWin (Standard for KDE)
- Transparency: A compositing window manager and additional X server expansion are required so that transparency is supported in AIR applications.

The following are supported:

- Compositing Windows manager: Beryl, Compiz, Compiz-fusion
- X server expansions: Composite, Render, Shape
- Flash Player: Flash Player 10.2 or higher are required for seamless installation (Badge) from the Internet.

2.3.2 Download and install offline version

1. Using your browser, open the website <http://www.solar-inverter.com/eu/en/pv-planner.htm>.
2. Register in the Delta Customer Portal (see “3. Registration”, p. 7).

3. Start the download and save the installation file on your computer.
4. Start the installation file (e.g. by double-clicking). Follow the installation instructions.

NOTE

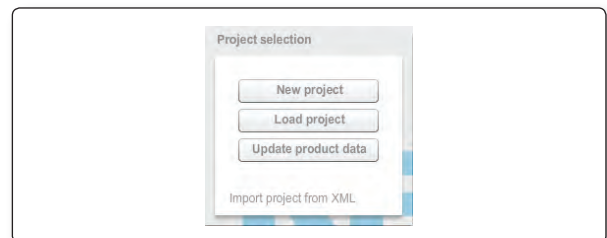


The Adobe® AIR software from Adobe Systems is required to install and execute the offline version of the PV Planner. You can download Adobe AIR from the Adobe website.

5. After the installation is complete, the PV Planner is automatically started.

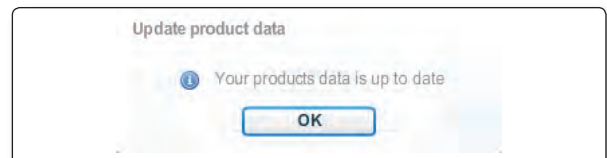


6. If the update of product data does not start automatically, click the **Update product data** button to download the current product data to the modules and the inverters.

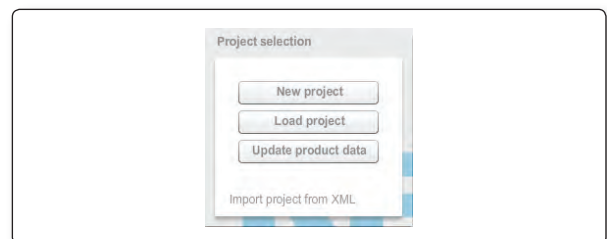


→ The current product data is downloaded.

→ After completion of the update, a message appears.



7. To start the first project, click on the **New Project** button.



3. Registration

NOTE



- If you already have a customer account for the SOLIVIA monitoring, you can use this login data and do not need to register again.

You can test the PV Planner before you register. Click the **Try out** button. In test mode, all functions of the PV Planner are available; however, registration is required to save the project.

1. To register, click **Register?** in the *Login* dialog box.

→ The *Create your Delta Customer Account* dialog box opens.

2. Fill in all bold entry fields in the form.

NOTE



- To change the language, click the small flag in the *Create your Delta Customer Account* dialog box at the top right and select the language desired.

NOTE



- Enter a valid **E-mail address**, since an E-mail will be sent upon completing the registration. The E-mail address is later used as user name when logging in.
- Enter a secure **Password**. Observe the notes that appear when entering the password.

3. If you do **not** want to receive the newsletter, deselect the option **Yes, I want to subscribe to the SOLIVIA Solar News**. Click the text so that the check disappears from the small square.
 4. Carefully read the general terms of business and the data privacy statement. Click the links **Terms of Use** and **Privacy Statement**.
 5. Finally, click the **I accept** button.
 - If the filled out registration form was successfully transmitted, the message "Your registration was successful" is displayed in the browser.
 - In addition, an E-mail is sent to the E-mail address that was specified in the registration form.
 6. To complete the registration, click the corresponding link in the E-mail that was sent to your E-mail address.
 - When the registration was successfully completed, the message "Confirmation successful" is displayed in the browser.
- ☒ The registration is complete, your customer account is activated and you can register at the PV Planner.

4. Project selection

In the *Project selection* area you have the following options:

- Start new project
- Load saved project
- Import a project in XML format

NOTE



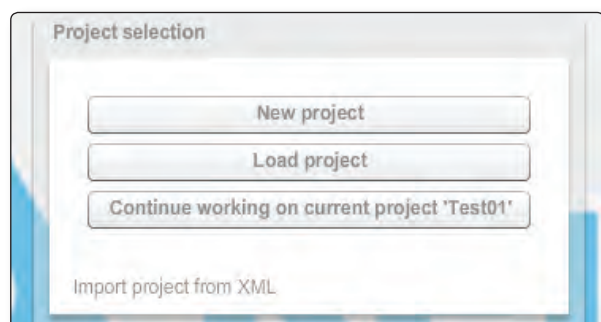
- Do not forget to save the current project before you start working on a new project.

4.1 Open project selection

- Click the **Project selection** button in the upper area of the main window.



→ The *Project selection* dialog box opens.



Option	Description
New project	Starts a new, empty project.
Load project	Opens a selection dialog to load a saved project.
Continue working on ...	Returns back to the current project. This option is especially useful if the current project has not yet been saved.
Import project from XML	Imports a project that was previously exported to XML.

4.2 Start new project

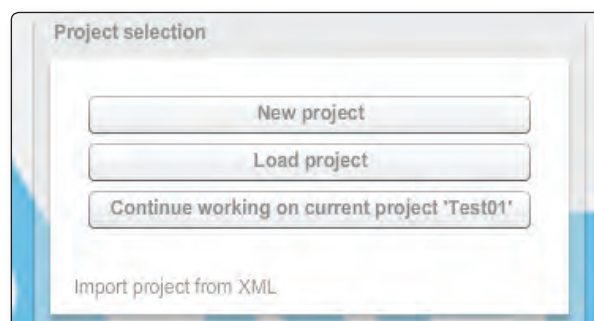
If work is being done on a project, a new project can be started in the project selection area.

1. Click the **Project selection** button in the upper area of the main window.



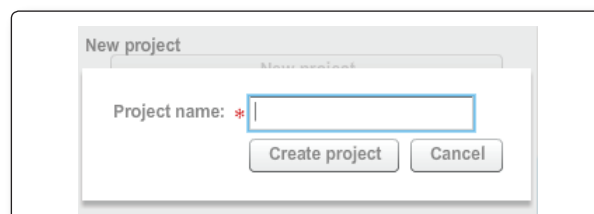
→ The *Project selection* dialog box opens.

2. In order to start a new, empty project, click the **New project** in the *Project selection* dialog box.



→ The *New project* dialog box opens.

3. Enter a name and click the **Create project** button.



→ A new, empty project is created.

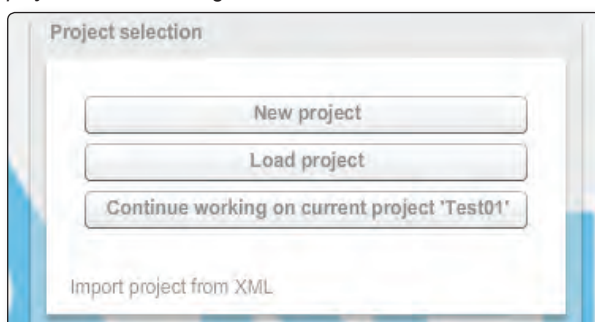
4.3 Load saved project

1. Click the **Project selection** button in the upper area of the main window.



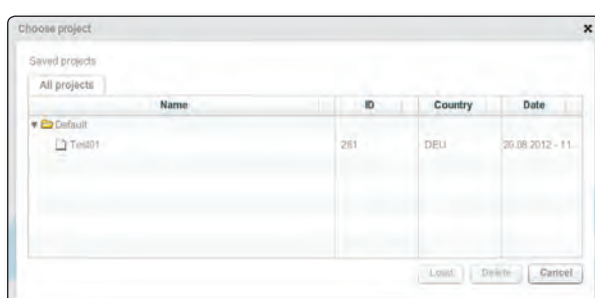
→ The *Project selection* dialog box opens.

2. In order to load a project, click the **Load project** button the *project selection* dialog box.



→ The *Choose project* dialog box opens.

4. Click the project to be loaded and then the **Load** button.



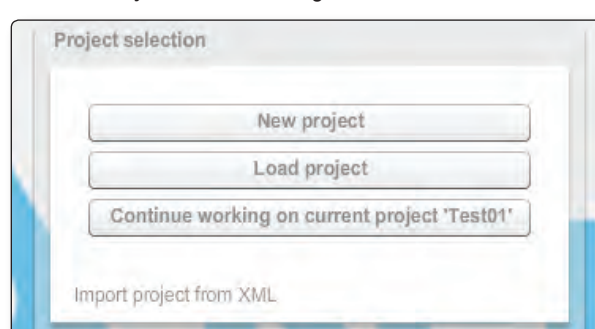
4.4 Delete saved project

1. Click the **Project selection** button in the upper area of the main window.



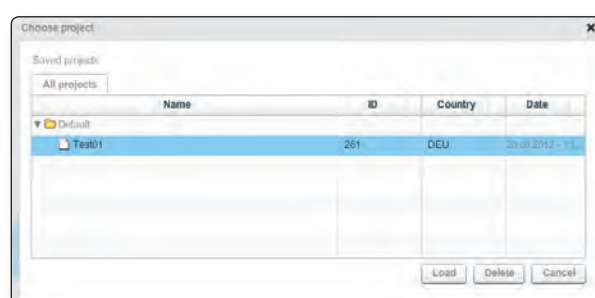
→ The *Project selection* dialog box opens.

2. In order to delete a saved project, click the **Load project** button in the *Project selection* dialog box.

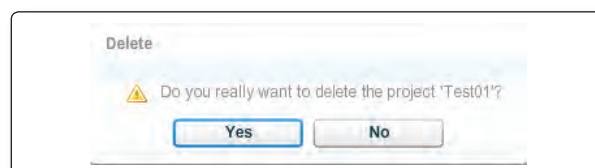


→ The *Choose project* dialog box opens.

3. Click the project to be deleted and then the **Delete** button.



→ A confirmation query is opened.



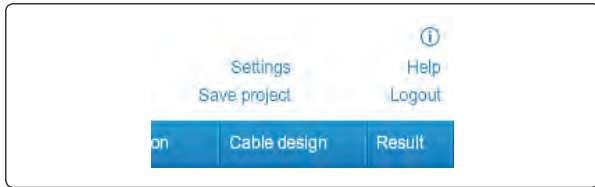
4. Confirm the deletion by clicking the **Yes** button.

4. Project selection

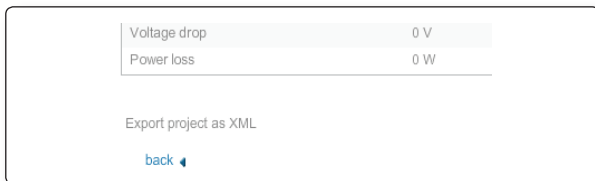
4.5 Exporting project as XML

The XML format enables the exchange of project data with other PV planners and the further processing in all programs that can process XML data. The export can be started in the *Result* area.

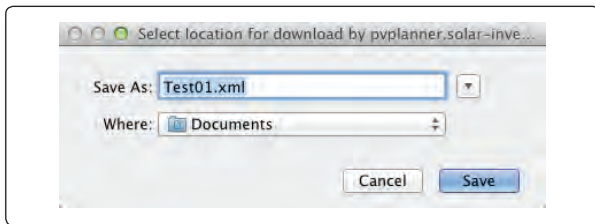
1. To open the *Result* area, click the **Result** button in the upper right area of the PV Planner.



2. Click the link Export project as XML at the very bottom in the *Result* area.



→ The dialog box *Select the folder for ...* opens.



3. Select a location to save the project and enter a name. Next click the **Save** button.
→ The project is saved as an XML file in the specified folder (file name "<project name>.xml").

4.6 Import project from XML

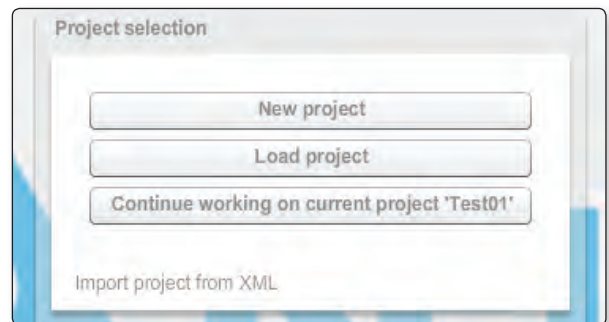
If a project is exported as XML, it can, for example, be imported into another PV Planner.

1. Click the **Project selection** button in the upper area of the main window.



→ The *Project selection* dialog box opens.

1. Click Import project from XML in the *Project selection* dialog box.



→ The dialog box *Select the file to be loaded ...* opens.

2. Select the project to be loaded (file name "<Project_name>.xml") and click the **Open** button.

→ The loaded project is displayed in the PV Planner.

5. Location and customer data

The screenshot shows the 'Location and customer data' tab in the SOLIVIA PV Planner software. The interface is divided into three numbered sections:

- 1 Personal data:** Includes fields for Salutation (Mrs.), Title, First Name, Name, Street / House number, Zip code / City, State / Province, and Country.
- 2 Installation address:** Includes a checkbox for 'Apply personal data' and identical fields to Section 1.
- 3 Location:** Includes fields for Region (Europe), Grid voltage (230 V), and Configuration conditions (Min. Module temp., Max. Module temp., Dimensioning temp., Irradiation) with sliders and an STC button.

5.1 Overview

The *Location and customer data* is the starting point for each new project. In this area, you can manage personal data and the general data for the PV system. This area is divided into the following sections:

- 1 System planner The data of the system planner
- 2 Installation address The address of the PV system, if necessary, with added contact partner.
- 3 Location Further information regarding location of the PV system. This information is important for a correct calculation of the system configuration.

5.2 “System planner” section

NOTE



- Save the project regularly to avoid data loss.

Personal data

Salutation: Mrs. ▼

Title:

First Name:

Name:

Street / House number:

Zip code / City:

State / Province:

Country:

In this area, data of the system planner is managed. The data is used if the result of the configuration is printed.

This information is not necessary for a correct use of the PV Planner. The entry fields can also remain blank.

5.3 “Installation address” section

Installation address

Apply personal data ☐

Salutation: Mrs. ▼

Title:

First Name:

Name:

Street / House number:

Zip code / City:

State / Province:

Country:

In this area, the address data of the PV system is managed. The data is used if the result of the configuration is printed.

This information is not necessary for a correct use of the PV Planner. The entry fields can also remain blank.

- To adopt the data from the *system planner* area, click the option **Apply personal data**.

→ The data is copied in the *Installation address* area.

5.4 “Location” section

Location

Region: Europe ▼

Grid voltage: 230 V ▼

Configuration conditions

Min. Module temp.: -10 °C

Max. Module temp.: 70 °C

Dimensioning temp.: 25 °C

Irradiation: 1,000 W/m²

STC

The accuracy of the information in the location area is important so that reliable calculations can be created in the PV Planner.

The following table describes the meaning of individual entry fields.

Entry field	Description
Region	Limits the list of displayed inverters to those that are permitted in the region. The Delta web page contains a country-specific list.
Grid voltage	Is used to calculate the AC side loss of cables.
Configuration conditions	
Min. module temperature	Minimum/maximum module temperatures which are to be used for calculations. The minimum module temperature applies for the use in winter and should be set to -10 °C to -20 °C. The maximum module temperature applies for the use in summer and should be set to +70 °C to +80 °C. Since this information is very dependent on the location of the PV system, orientation should definitely be on the local circumstances.
Max. module temperature	
Design temperature	Temperature of dimensioning After the design temperature, the nominal operating condition of the system is laid out.
Irradiation	The adopted radiation power of the sun. The standard value is established at 1000 W/m ²
STC	Standard Test Conditions according to IEC 60904-3 1989. The values are returned to the standard values by clicking the button. Design temperature to 25 °C and the irradiation to 1000 W/m ² .

6. System wizard

6.1 Overview

The *System wizard* provides the opportunity to create an initial system configuration in a few steps. The general conditions are merely defined (1 to 3) and the system wizard develops up to 10 suggestions for the system configuration. The suggestions can afterwards be adapted to the specific requirements in the *System configuration* area.

- | | | |
|---|-----------------------|--|
| 1 | Modules | A standard module can be selected or a customer-specific module can be created (see “10. Managing modules”, p. 32). |
| 2 | PV generator | Establish the size as number of modules or peak power in kWp. Based on the selected modules in 1, every differing value is automatically calculated. |
| 3 | Inverters | Select the inverters that are to be used in the PV system. |
| 4 | Configure PV system | The system wizard is started by clicking the button; it develops suggestions for the configuration based on the settings in 1 to 3. |
| 5 | Configured PV systems | The list of the suggestions for the system configuration. A maximum of 10 suggestions are displayed. |



Which inverters are available for selection depends on the **Region** that is set in the *Location and customer data* area.
 ► Always make sure that the correct region is set.

6.2 Configure a PV system with the system wizard

NOTE



- Save the project regularly to avoid data loss.

The system wizard provides the opportunity to create an initial system configuration in a few steps. This system configuration can then be adapted to the specific requirements.

The following system components must be defined so a calculation of the system configuration is possible:

- Used PV modules
- Size of the PV generator
- Used inverters

6. System wizard

6.2.1 Set module type

Select module:

- 1 50-ALF/17 (Schott Solar AG) ▼
- 2 ▶ Module data
- 3 ▶ Create custom module

A standard module can be selected or a customer-specific module can be created:

- ▶ To select a standard module, click the **Select module** 1 button.

50-ALF/17 (Schott Solar AG) ▼

→ The *Select module* dialog box opens.

Select module

Module search:

Manufacturer	Type	MPP power	Technology
Schott Solar AG	50-ALF/17	50 Wp	EFG
Schott Solar AG	30-DGF/30-B	255 Wp	ribson
Schott Solar AG	30-DGF/30	300 Wp	EFG
Schott Solar AG	ASE-30/DGF-FT / 17 V, 30 W	300 Wp	EFG
Schott Solar GmbH (erst bei Solarline)	RSM 30 Photovoltaik	48 Wp	poly
BP Solar	BP 275 F	75 Wp	mono
BP Solar	BP 556 F	65 Wp	mono-GIBC
GSS Gebäude-Solarsysteme GmbH	GSS-PV-182	182 Wp	mono
GSS Gebäude-Solarsysteme GmbH	GSS-PV-216	216 Wp	mono
GSS Gebäude-Solarsysteme GmbH	GSS-PV-293	293 Wp	mono

More information ▶ Create custom module from existing ▶ Create custom module

Accept Cancel

A pre-defined module can be selected there. How to work with the module selection is described in section "10. Managing modules", p. 32.

- ▶ To display the technical data of the selected module, click the link **Module data** 2.

▶ Module data

→ The Module information dialog box opens.

Module information

Name:	50-ALF/17	NOCT:	n/a
Manufacturer:	Schott Solar AG	Max. system voltage:	600 V
Nominal power (Pmpp):	50 Wp	Cell count:	36
Tolerance plus:	n/a	Length:	965 mm
Tolerance minus:	n/a	Width:	452 mm
Nominal voltage (Umpp):	17 V	Height:	51 mm
Nominal current (Impp):	2.90 A	Weight:	6 kg
Open circuit voltage (Uoc):	20.70 V	Connection type:	
Short circuit current (Isc):	3.20 A	Cable length:	0 mm
Module efficiency:	11.5 %	Module technology:	EFG
Temp. coeff. Pmpp:	-0.41 %/K		
Temp. coeff. Isc:	0.09 %/K		
Temp. coeff. Uoc:	-0.51 %/K		

Input locale: DE (DE) ☐ use for displayed units

Close

- ▶ To create a custom module, click the link **Create custom module** 3.

▶ Create custom module

→ The *Create custom module* dialog box opens.

Create custom module

Name:		NOCT:		°C
Manufacturer:		Max. system voltage:		V
Nominal power (Pmpp):		Cell count:		
Tolerance plus:	%	Length:		mm
Tolerance minus:	%	Width:		mm
Nominal voltage (Umpp):	V	Height:		mm
Nominal current (Impp):	A	Weight:		kg
Open circuit voltage (Uoc):	V	Connection type:		
Short circuit current (Isc):	A	Cable length:		mm
Module efficiency:	%	Module technology:		
Temp. coeff. Pmpp:	%/K			
Temp. coeff. Isc:	%/K			
Temp. coeff. Uoc:	%/K			

Input locale: EN (EN) Save Cancel

How to create a custom module is described in chapter "10. Managing modules", p. 32.

6.2.2 Establish the size of the PV generator

Size of PV generator

- 1 ☒ Module count: 60
- 2 ☐ Peak power [kWp]: 3

The size of the PV generator can be listed as the number of modules 1 or as the peak power in kWp 2. The second value is automatically calculated based on the selected module.

6.2.3 Select inverters

Select inverter(s):

- 1 ☒ Select/unselect all listed inverters
- 2 ☒ Show/hide 1-phase inverters
- 3 ☒ Show/hide 3-phase inverters

4

Inverter
☒ SOLIVIA 2.5 EU G3 TR
☒ SOLIVIA 3.0 EU G3 TR
☒ SOLIVIA 3.3 EU G3 TR
☒ SOLIVIA 5.0 EU G3 TR
☒ SOLIVIA 15 EU G3 TL
☒ SOLIVIA 20 EU G3 TL
☒ SOLIVIA 11 EU G4 TR

The list contains all inverters that are available for the set region. The region is set in the *Location and customer data* area.

Using the options **Show/hide 1-phase inverters** 2 and **Show/hide 3-phase inverters** 3, the list can be limited to 1-phase or 3-phase inverters.

All inverters that are marked with a check ☒ in the list are considered by the system wizard when configuring the PV system.

The option **Select/deselect all inverters** 1 is the easiest way to select or deselect all inverters of the list.

6.2.4 Start configuration of the PV system

After establishing module type, size of the PV generator and module type, the configuration of the PV system can start.

- Click the **Configure PV system** button.



→ The system wizard starts the configuration of the PV system.

6.2.5 Analyze configured PV systems

The configuration variants found are listed on the right side of the system wizard. The number of displayed system configurations is limited to a maximum of 10.

System configurations: 10

8 ☐ Consider max. unbalanced AC load: 4600 VA

Inverter set	Qua...	Modules ...	Strin...	Power [W]	Modules	Pow...
▼ 1.						
SOLIVIA 3.0 EU G3 T	3	4	4	4520	16	98%
SOLIVIA 3.3 EU G3 T	1	6	2	3390	12	103%
▼ 2.						
SOLIVIA 3.3 EU G3 T	5	6	2	3390	12	103%
▼ 3.						
SOLIVIA 3.0 EU G3 T	6	5	2	2825	10	94%
▼ 4.						
SOLIVIA 5.0 EU G3 T	2	5	3	4238	15	92%
SOLIVIA 3.0 EU G3 T	3	5	2	2825	10	94%
▼ 5.						
SOLIVIA 5.0 EU G3 T	4	5	3	4238	15	92%
▼ 6.						
SOLIVIA 5.0 EU G3 T	1	4	4	4520	16	98%
SOLIVIA 3.3 EU G3 T	1	6	2	3390	12	103%
SOLIVIA 2.5 EU G3 T	4	4	2	2260	8	90%
▼ 7.						
SOLIVIA 3.0 EU G3 T	2	5	2	2825	10	94%
SOLIVIA 2.5 EU G3 T	5	4	2	2260	8	90%
▼ 8.						
SOLIVIA 3.3 EU G3 T	2	6	2	3390	12	103%

If the system wizard could not find any system configuration, a message is displayed.

The following information is displayed for each system configuration:

Column name	Description
1 Inverter set	Name of the inverter types that are used in the configuration
2 Quantity	Number of inverters per inverter type
3 Module per string	Module per string
4 Strings	Number of parallel strings per inverter
5 Power [W]	Total power of the modules per inverter
6 Modules	Total number of the modules per inverter
7 Power ratio	Dimensioning factor $P_{\text{module}}/P_{\text{inverter}}$: The total power of all modules in relation to total power of all inverters. Values >100 % mean that the overall power of the modules is greater than that of the inverters, otherwise less. System configurations with power ratios between 90% and 110% are optimal.
8 Consider max. unbalanced AC load	If a maximum asymmetric load on the AC side must be considered, activate this option and enter a value for the maximum asymmetric load.

Maximum unbalanced AC load

An unbalanced load is present if different active power is fed in phases L1, L2 and L3 of a 5-conductor grid. Such an unbalanced load constitutes a large load for the grid. Therefore in some countries (e.g. Germany and Italy) a maximum permitted unbalanced load may not be exceeded on the AC side. In Germany, the maximum permitted unbalanced AC load is currently (2012) 4.6 kW.



Some system configurations require connecting a number strings on an inverter that is larger than the number of DC inputs on the inverter.

Information regarding the DC inputs are at the link [Inverters](#) in the *System configuration* area.

- If the number of strings is greater than the number of DC inputs, a string combiner box must be added to the *Cable design* area (see "8. Cable design", p. 22).

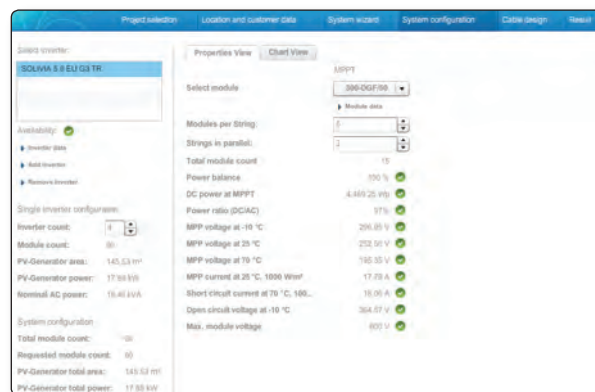
6.2.6 Further processing a system configuration

One of the system configurations that were calculated by the system wizard can be selected for further processing.

- Click one of the system configurations to manually further process them.

Inverter set	Qua...	Modules ...	Strin...	Power [W]	Modules	Pow...
▼ 1.						
SOLIVIA 3.0 EU G3 T	6	5	2	2980	10	99%
▼ 2.						
SOLIVIA 5.0 EU G3 T	4	5	3	4469	15	97%
▼ 3.						
SOLIVIA 5.0 EU G3 T	2	5	3	4469	15	97%
SOLIVIA 3.0 EU G3 T	3	5	2	2980	10	99%

→ The system configuration is adopted in the *System configuration* area.



→ The *System configuration* opens and the selected system configuration is displayed.

In the *System configuration* the settings can be manually adapted (see "7. System configuration", p. 16).

7. System configuration

The screenshot displays the 'System configuration' window of the SOLIVIA PV Planner. It features a top navigation bar with tabs: 'Project selection', 'Location and customer data', 'System wizard', 'System configuration' (active), 'Cable design', and 'Result'. The main content area is divided into four numbered sections:

- 1. Select inverter:** A list box showing 'SOLIVIA 20 EU G4 TL', 'SOLIVIA 5.0 EU G4 TR', and 'SOLIVIA 3.6 EU G4 TR'. Below it are 'Availability' (green check), 'Inverter data', 'Add inverter', and 'Remove inverter' buttons.
- 2. Single inverter configuration:** Fields for 'Inverter count' (1), 'Module count' (89), 'PV-Generator area' (151.89 m²), 'PV-Generator power' (20.50 kW), and 'Nominal AC power' (20 kVA).
- 3. System configuration:** Fields for 'Total module count' (140), 'Requested module count' (140), 'PV-Generator total area' (238.92 m²), and 'PV-Generator total power' (32.25 kW).
- 4. Properties View / Chart View:** A table showing technical details for two MPPT trackers (MPPT 1 and MPPT 2). The table includes columns for 'Select module', 'Modules per String', 'Strings in parallel', 'Total module count', 'Power balance', 'DC power at MPPT', 'Power ratio (DC/AC)', 'MPP voltage at -10 °C', 'MPP voltage at 25 °C', 'MPP voltage at 70 °C', 'MPP current at 25 °C, 1000 W/m²', 'Short circuit current at 70 °C, 100...', 'Open circuit voltage at -10 °C', and 'Max. module voltage'. Each row has a green checkmark indicating technical feasibility.

7.1 Overview

In the system configuration area, either a system configuration can be processed from the system assistant or a new system configuration can be created completely by hand.

The data from the system wizard are automatically adopted.

The *System configuration* is divided into the following sections:

1	Select inverter	The list of the inverters that are used in the system configuration. The list can be manually adapted.
2	Single inverter configuration	The settings for the inverter that is currently selected in the list of inverters 1.
3	System configuration	The size of the entire PV generator with regard to number of modules and the PV total power.
4	Properties and charts	The technical details for each MPP tracker of the inverter that is currently selected in the list of inverters 1. The technical details can be displayed as a list (<i>Properties view</i> tab) or graphically (<i>Charts view</i> tab). Small symbols next to the data label the technical feasibility of the current settings.

7.2 "Select inverter" section

NOTE



► Save the project regularly to avoid data loss.

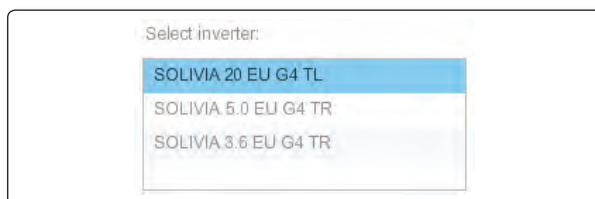


Entry	Description
1 Select inverter	The technical details are displayed for the marked inverters in sections <i>Configuration of the inverters</i> and <i>Characteristics/diagram</i> .
2 Availability	Indicates whether the marked inverter can currently be delivered.
3 Inverter data	Opens a dialog box with the technical data of the marked inverter.
4 Add inverters	Opens a dialog box in which a new inverter can be selected and added to the list of used inverters.
5 Remove inverter	Removes the marked inverter from the list of used inverters.

7.2.1 Display inverter data

The technical data for every inverter used can be displayed.

- Click an inverter in the list 1 to mark it.

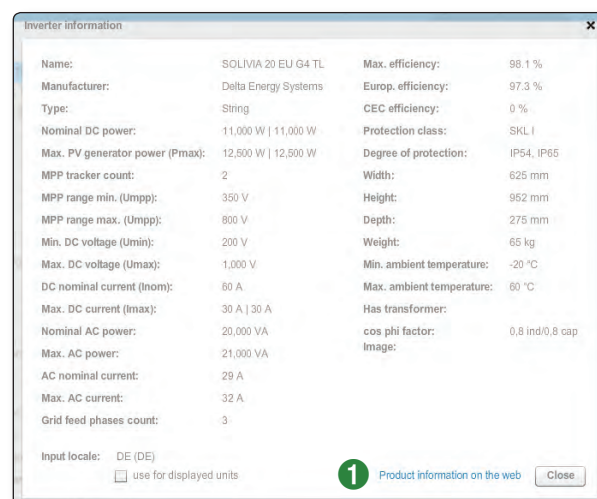


- Click the link Inverter data 3.



→ The *Inverter information* dialog box is displayed.

- For additional information about the inverter, click the link Product information on the web.



→ The web page with product information regarding the inverter opens.

7.2.2 Add inverters

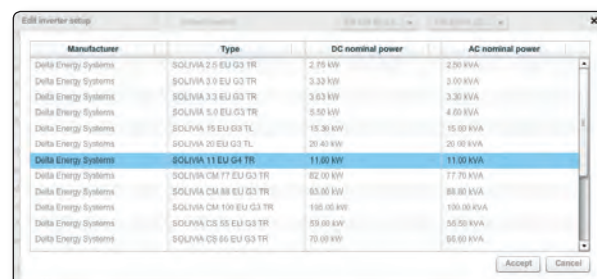
The list with the inverters can have new inverters added manually.

- Click the link Add inverter 4.

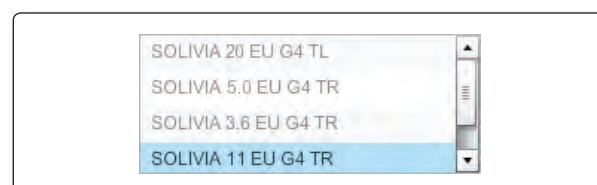


→ The dialog box *Process WR devices* is displayed.

- Click an inverter and then the **Accept** button.



→ The new inverter is added to the end of the list.

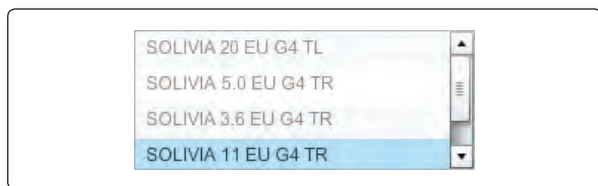


7. System configuration

7.2.3 Remove inverters

An inverter can be manually removed from the list.

1. Click an inverter in the list ①, to be removed.

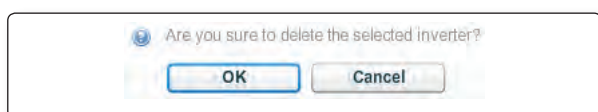


2. Click the link [Remove inverter](#).

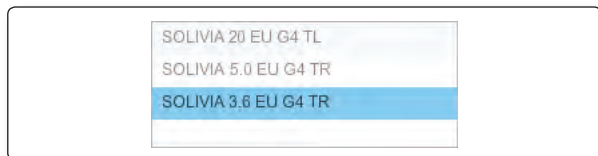


→ A confirmation query appears.

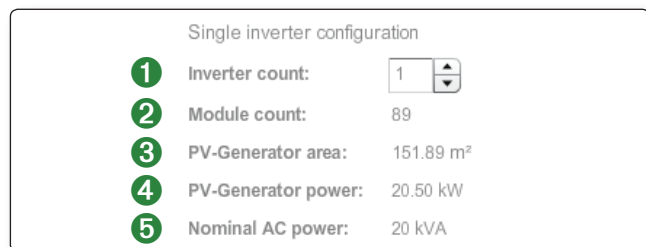
3. To remove the inverter, click the **OK** button.



→ The inverter is removed from the list.



7.3 "Single inverter configuration" section

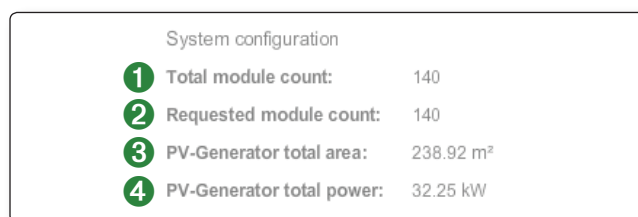


All information in this section relates to the inverter that is marked in the list of used inverters.

Entry	Description
① Inverter count	Number of inverters of this type
② Module count	Number of connected modules
③ PV-Generator area [m²]	Total surface of connected modules
④ PV-Generator power [kWp]	Total power of connected modules
⑤ Nominal AC power [kVA]	Total rated power of the inverters on the AC side.

If the number of inverters changes, the information in the sections *Single inverter configuration* and *System configuration* is automatically adapted.

7.4 "System configuration" section



Entry	Description
① Total module count	Total number of modules that are used in the current system configuration.
② Requested module count	Number of modules that were entered as default in the <i>System assistant</i> in the section <i>Size of the PV generator</i> .
③ PV-Generator total area [m²]	Total surface of all modules that are used in the current system configuration.
④ PV-Generator total power [kWp]	Total power of all modules that are used in the current system configuration.

7.5 "Properties and charts" section

All information in section *Properties and charts* relates to a single inverter, divided by MPP trackers. All inverters have one or several MPP trackers.

7.5.1 Properties view

	MPPT 1	MPPT 2
Modules per String:	11	9
Strings in parallel:	4	5
Total module count	44	45
Power balance	49.44 %	50.56 %
DC power at MPPT	10,135.44 Wp	10,365.80 Wp
Power ratio (DC/AC)	103%	103%
MPP voltage at -10 °C	603.20 V	493.53 V
MPP voltage at 25 °C	535.70 V	438.30 V
MPP voltage at 70 °C	448.92 V	367.30 V
MPP current at 25 °C, 1000 W/m²	19.04 A	23.81 A
Short circuit current at 70 °C, 100...	19.43 A	24.29 A
Open circuit voltage at -10 °C	734.49 V	600.95 V
Max. module voltage	1,000 V	1,000 V

All information in a column always refer to the MPP tracker that is specified above the column (e.g. "MPPT 1").

Entry	Description
Select module	The connected module type
Module data	Opens a separate dialog box with the technical data of the selected module (see "10. Managing modules", p. 32).
Modules per string	Number of modules that are switched in a series on a string.
Strings in parallel	Number of parallel closed strings. All strings have the same design per MPP tracker.
Total module count	The total number of modules results from multiplying the number of modules per string times the number of strings
Power balance	Dimensioning factor: Power ratio of the modules at the overall power of all modules that are connected to the inverter.
DC power at MPPT	Peak power of connected modules
Power ratio (DC/AC)	DC power of all modules that are connected to the inverter, in relation to AC rated power of the inverter
MPP voltage at ...	The MPP voltages with three differing temperature values ¹⁾ specified per MPP tracker: - with minimum module temperature - with maximum module temperature - with design temperature
MPP current at ...	MPP current with design temperature and specified irradiation ¹⁾ .
Short circuit current at ...	Short circuit current with maximum module temperature and specified irradiation ¹⁾ .

Entry	Description
Open circuit voltage at ...	Open circuit voltage with minimum module temperature ¹⁾
Max. module voltage	Maximum DC input voltage

¹⁾ The values are established in the *Location and customer data* area under *location*. Changes to the values are immediately considered in the system configuration.

Working with characteristic view

A different module can be selected for every MPP tracker and the number of strings or modules per string can be set to differ.

Every time one of these settings is changed, the system configuration is automatically recalculated.

- To select a different module, click the **Select module** button.

→ The *Select module* dialog box opens.

See "10. Managing modules", p. 32 for a detailed description of the dialog *Module selection*.

- Click a module and then the **Accept** button.

→ The new module is allocated to the MPP tracker.



If the number of parallel strings is greater than the number of DC inputs on the inverter, a string combiner box must be added to the *Cable design* area. Information regarding the DC inputs is in the technical data of the inverter at the link [Inverter data](#) in the *System configuration* area.

7. System configuration

Meaning of symbols

In addition to the technical data, information regarding efficiency of the current system configuration is displayed.

Symbol: Green check mark ✓

Example: Power ratio (DC/AC) 96% ✓

Meaning: The value is in the optimal range

Symbol: Yellow exclamation mark ⚠

Example: Power ratio (DC/AC) 118% ⚠

Meaning: The value lies outside of the optimal range, but still within the permitted range.

Symbol: Red exclamation mark ❗

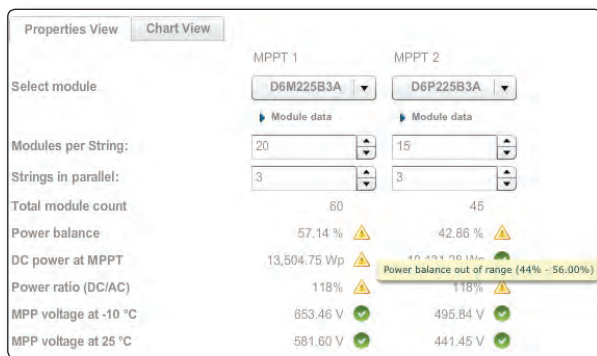
Example: Power ratio (DC/AC) 141% ❗

Meaning: The value is outside of the permitted range. A configuration with this value is not possible.

A description in the form of tool tips can be displayed for every value and every symbol. Varying information is displayed for value and symbol.

► To display the description, move the cursor over a value or a symbol.

→ Near the cursor, a tool tip is displayed:



7.5.2 Diagrams

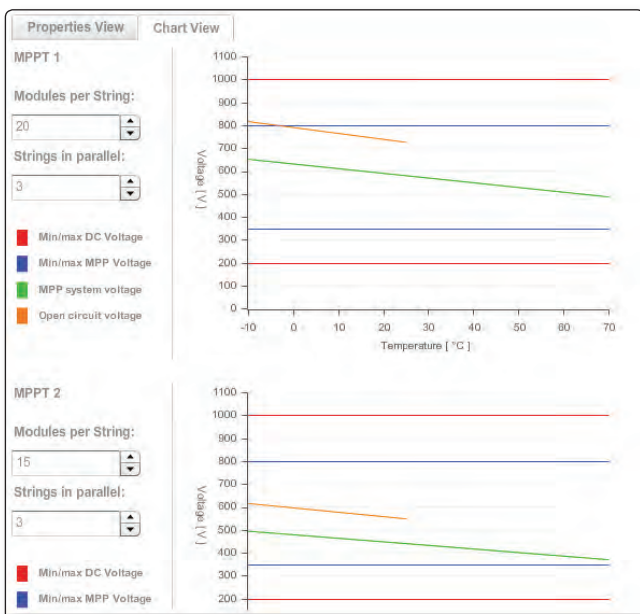
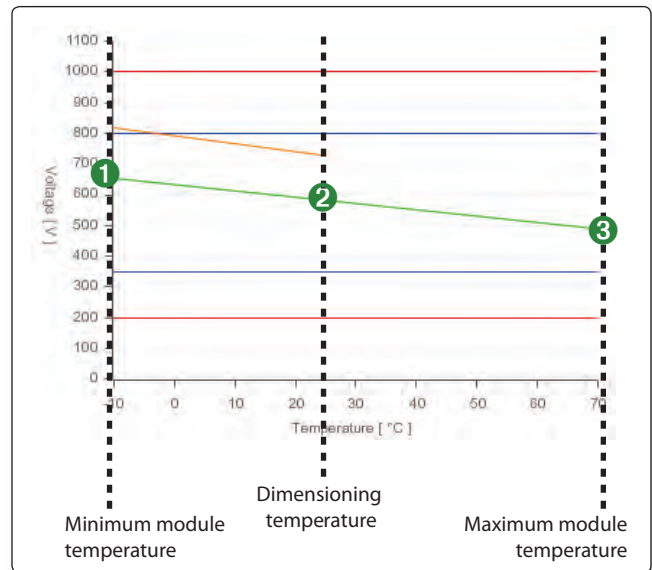


Fig. 7.1.: Diagram view – overview

The diagram view represents the course of various voltages for each MPP tracker, dependent on the temperature.



- ① MPP voltage at minimum module temperature
- ② MPP voltage at dimensioning temperature
- ③ MPP voltage at maximum module temperature

Fig. 7.2.: Diagram view - description

The temperature range of the diagrams is determined by the minimum and maximum module temperature. The values are established in the *Location and customer data* area under *location*.

The MPP system voltage (green line) contains the three MPP voltages from the characteristic view, among other things.

Minimum and maximum DC voltage (red lines) labels the DC input voltage range of the inverter.

Minimum and maximum MPP voltage (blue lines) label the DC input voltage range with which the MPP tracker is active. An inverter should always be operated in this DC input voltage range.

The open circuit voltage (orange line) is displayed in the temperature range between minimum module temperature and design temperature. The values are established in the *Location and customer data* area under *Location*.

Working with diagram view

If the number of modules per string or the number of strings change, the diagrams are automatically adapted.

If the cursor moves over the intersections of temperature and the characteristic, a legend with additional information in the form of tool tips is displayed at the cursor.

Every tool tip is designed as follows:

Line	Description
1	Name of the voltage, e.g. "MPP voltage"
2	Temperature value, e.g. the value of the minimum module temperature
3	Value of the voltage in this site

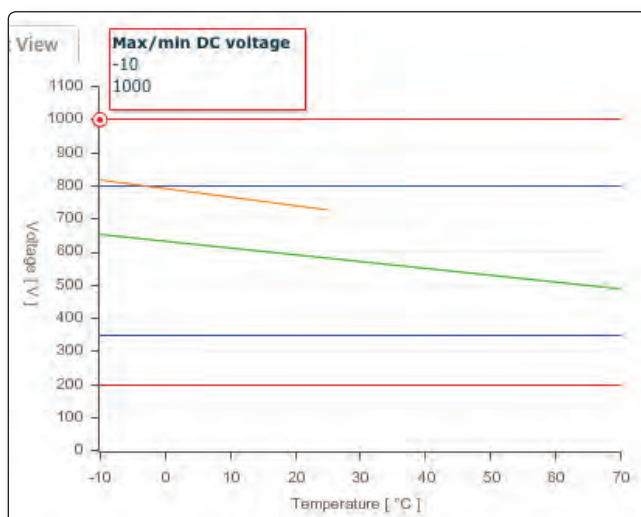


Fig. 7.3.: Example: Maximum DC voltage at minimum module temperature

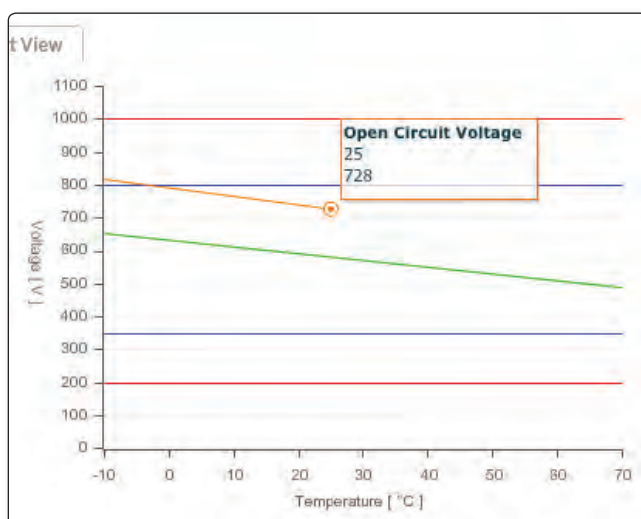


Fig. 7.4.: Example: Open circuit voltage at dimensioning temperature

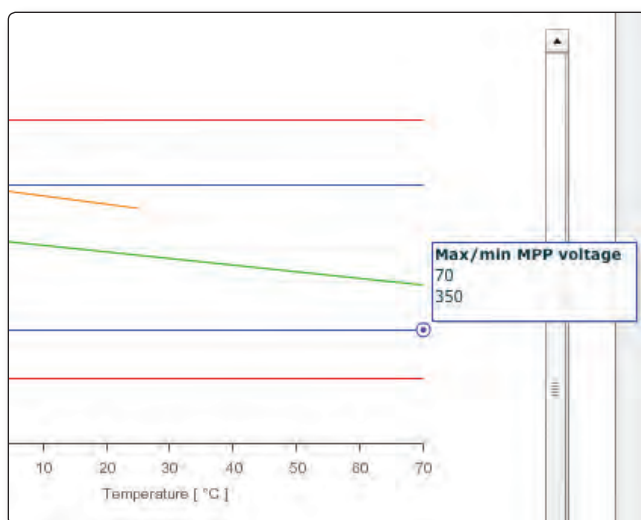


Fig. 7.5.: Example: Minimum MPP voltage at maximum module temperature

8. Cable design

Project selection

Location and customer data

System wizard

System configuration

Cable design

Result

DC-Side:

Select inverter:

SOLIVIA 20 EU G4 TL

SOLIVIA 5.0 EU G4 TR

SOLIVIA 3.6 EU G4 TR

Material/Cable cross section [...]

Simple cable length [m]:

Add string combiner box (SCB):

Max. strings at SCB input:

Material/Cable cross section [...]

Simple cable length [m]:

Quantity of SCB:

Loss from PV array to SCB:

Loss from SCB to Inverter:

Total DC cable loss:

MPPT 1

Cu

6

20

☒

8

Cu

6

0

1

14.22 W

0.16 %

0 W

0 %

14.22 W

0.16 %

MPPT 2

Cu

6

30

☐

31.25 W

0.31 %

AC-Side:

Inverter

Open phases

Phase mapping

L1

L2

L3

SOLIVIA 20 EU G4 TL

0

1

1

1

SOLIVIA 5.0 EU G4 TR

0

0

0

0

SOLIVIA 3.6 EU G4 TR

0

1

1

0

Material/Cable cross section [mm²]:

Simple cable length [m]:

Power [kW]:

Current:

Voltage drop:

Power loss:

Unbalanced load:

Total AC cable loss:

Cu

6

0

L1

L2

L3

N

11.27

10.27

10.27

48.99 A

44.64 A

44.64 A

4.35 A

0 V

0 V

0 V

0 V

0 W

0 W

0 W

0 W

1 kW

0 W

0 %

8.1 Overview

The information for the cable specification is found in the *Cable design* area. This information is necessary to be able to calculate the cable losses.

- 1 Cable design DC side
- 2 Cable design AC side

8.2 DC side

DC-Side:

Select inverter:

SOLIVIA 20 EU G4 TL
 SOLIVIA 5.0 EU G4 TR
 SOLIVIA 3.6 EU G4 TR

MPPT 1

Material/Cable cross section [mm²]: **2** Cu 6

Simple cable length [m]: **3** 20

Add string combiner box (SCB): **4** ☒

Max. strings at SCB input: **5** 8

Material/Cable cross section [mm²]: **6** Cu 6

Simple cable length [m]: **7** 0

Quantity of SCB: **8** 1

Loss from PV array to SCB: 14.22 W
0.16 % ✓

Loss from SCB to Inverter: **9** 0 W
0 % ✓

Total DC cable loss: **10** 14.22 W
0.16 % ✓

MPPT 2

Material/Cable cross section [mm²]: Cu 6

Simple cable length [m]: 30

Add string combiner box (SCB): ☐

Max. strings at SCB input: 8

Material/Cable cross section [mm²]: Cu 6

Simple cable length [m]: 0

Quantity of SCB: 0

Loss from PV array to SCB: 31.25 W
0.31 % ✓

Entry	Description
1 Select inverter	Indicates the inverters that are used in the system configuration. By clicking on an inverter, the cable design for this inverter is displayed.
2 Material/cable cross section [mm ²]	Single cable length between the strings of the PV module and string combiner box.
3 Single cable length [m]	Single cable length between the string of the PV module and the inverter. When using a string combiner box, the cable length between the string of the PV module and the string combiner box.
4 Add string combiner box (SCB)	If a string combiner box is to be used, this option must be activated. This activates the entries 6 to 8 .
5 Max. strings at SCB input	Maximum number of strings that can be connected to the string combiner box.
6 Material/cable cross section [mm ²]	Material and cable cross-section of the cable between string combiner box and inverter.
7 Single cable length [m]	Single cable length between string combiner box and inverter
8 Quantity of SCB	Number of string combiner boxes. The value is automatically adjusted if more strings are to be connected as DC inputs present at the string combiner box.
9 Loss from PV array to SCB Loss from SCB to inverter	Cable loss in watt and in percent for cable from PV generator to string combiner box and from string combiner box to inverter.
9 Total DC cable loss	Total cable losses in watt and in percent.

Single cable length **3**

When calculating, it is assumed that each 1 phase DC cable has the same length.

If the cable length for DC+ and DC- are very different, it is best to enter the average value.

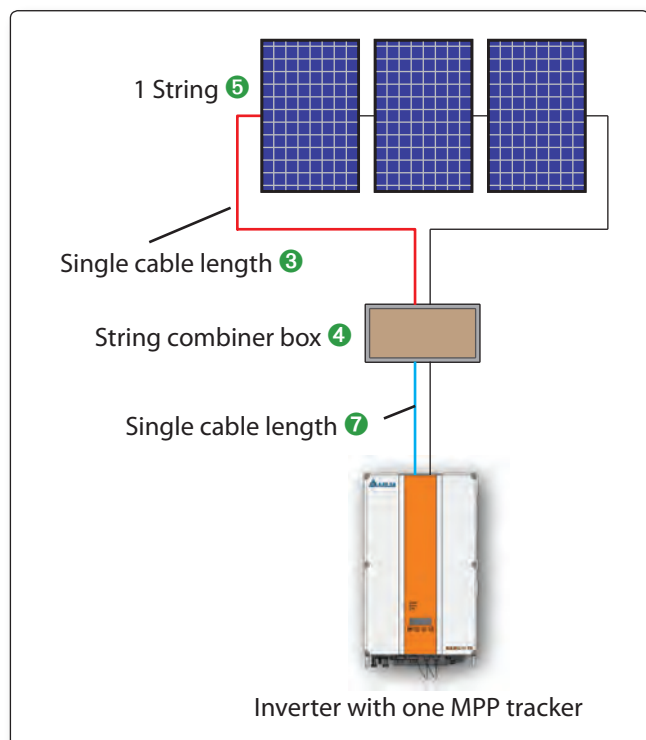


Fig. 8.6.: Example: Inverter with 1 MPP tracker, 1 string combiner box and 1 string

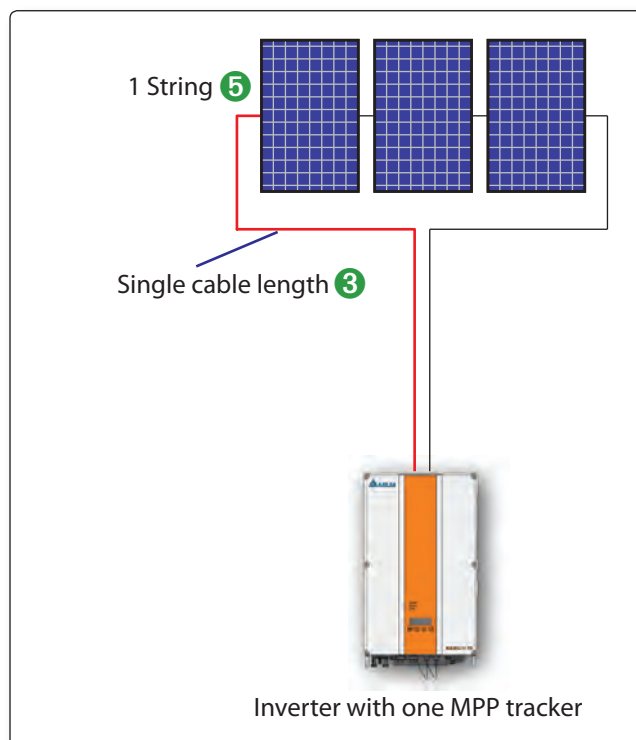


Fig. 8.7.: Example: Inverter with 1 MPP tracker and 1 string, without string combiner box

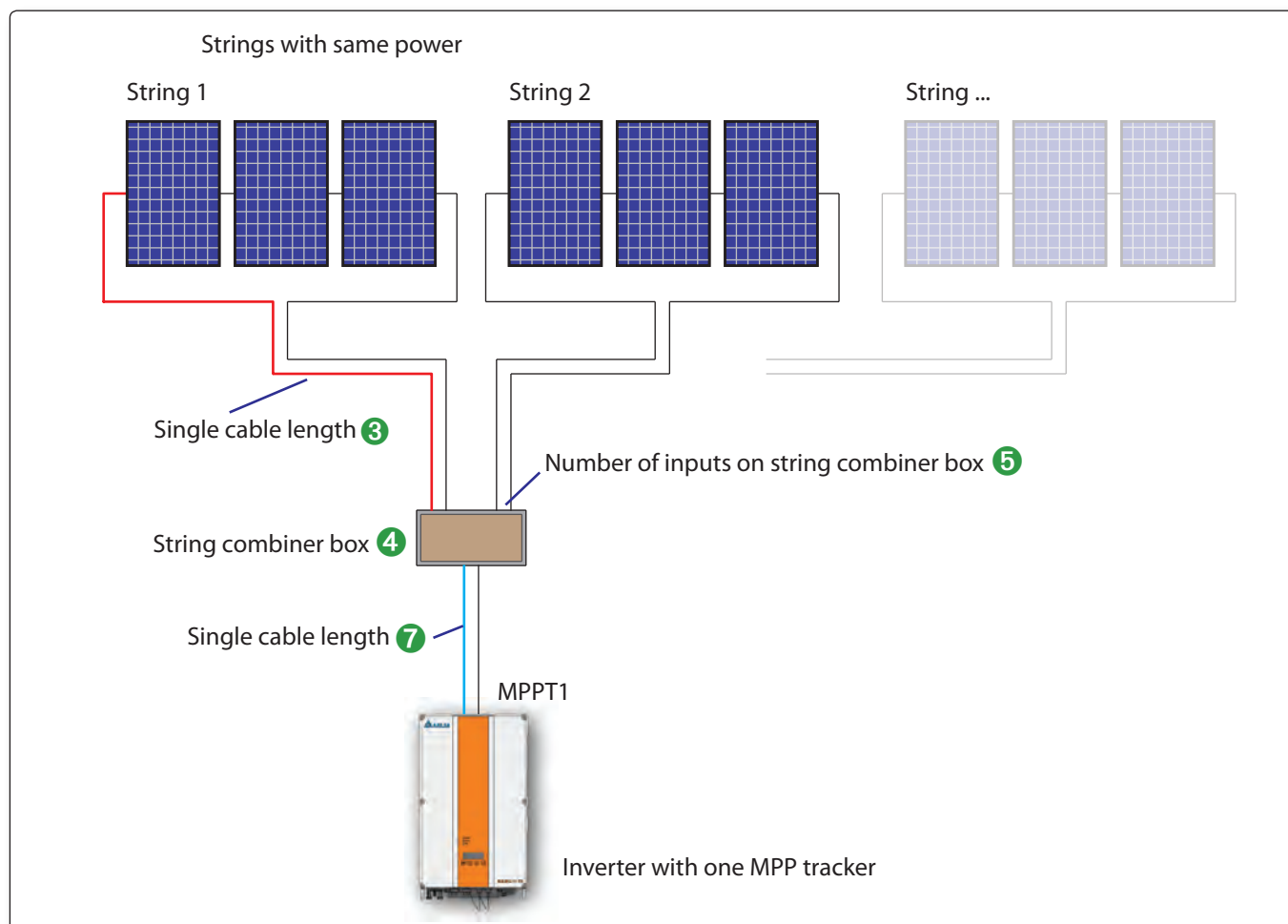


Fig. 8.8.: Example: Inverter with 1 MPP tracker, 1 string combiner box and several parallel strings

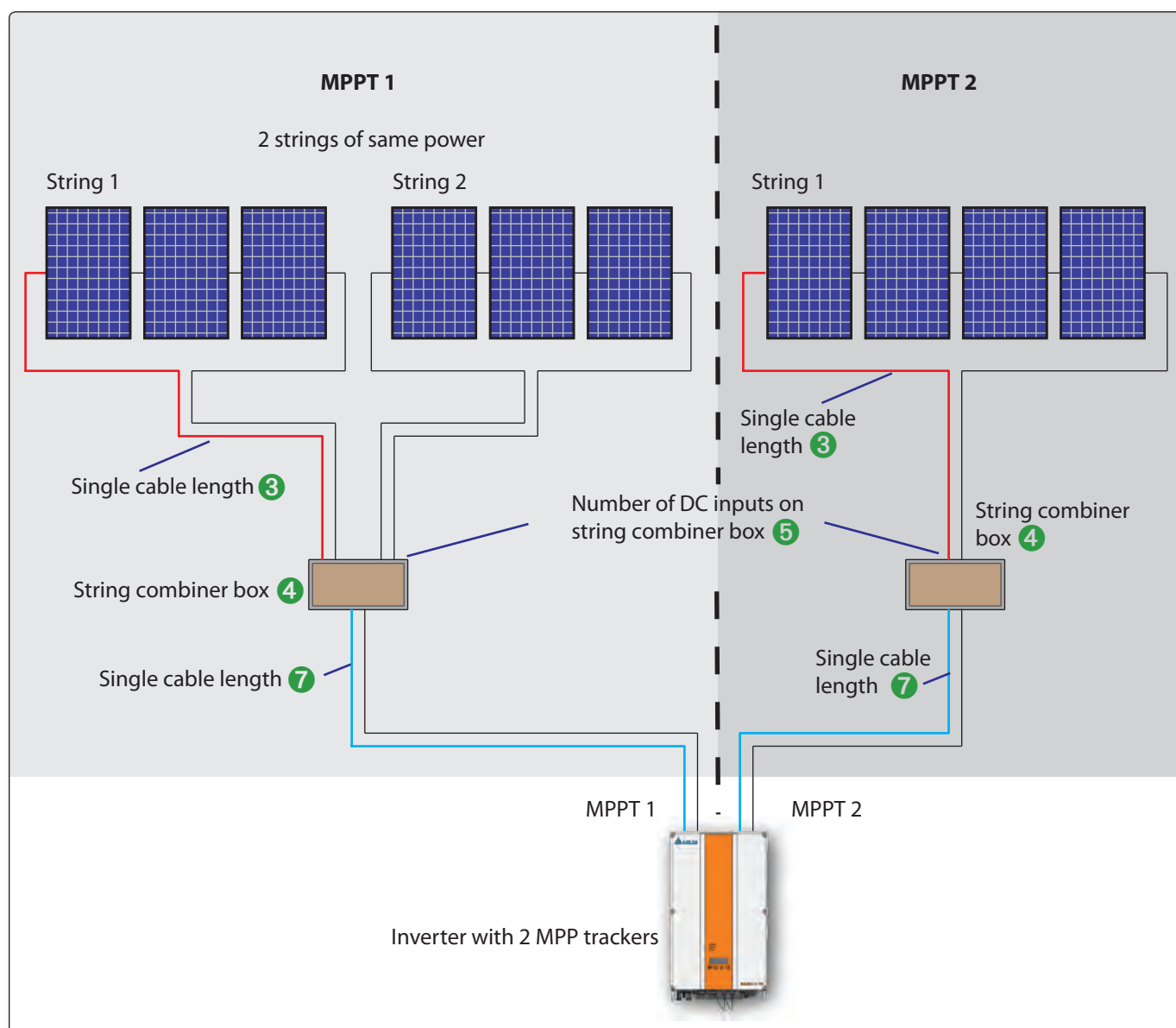


Fig. 8.9.: Example: Inverter with 2 MPP trackers; 1 string combiner box each at MPPT 1 and MPPT 2

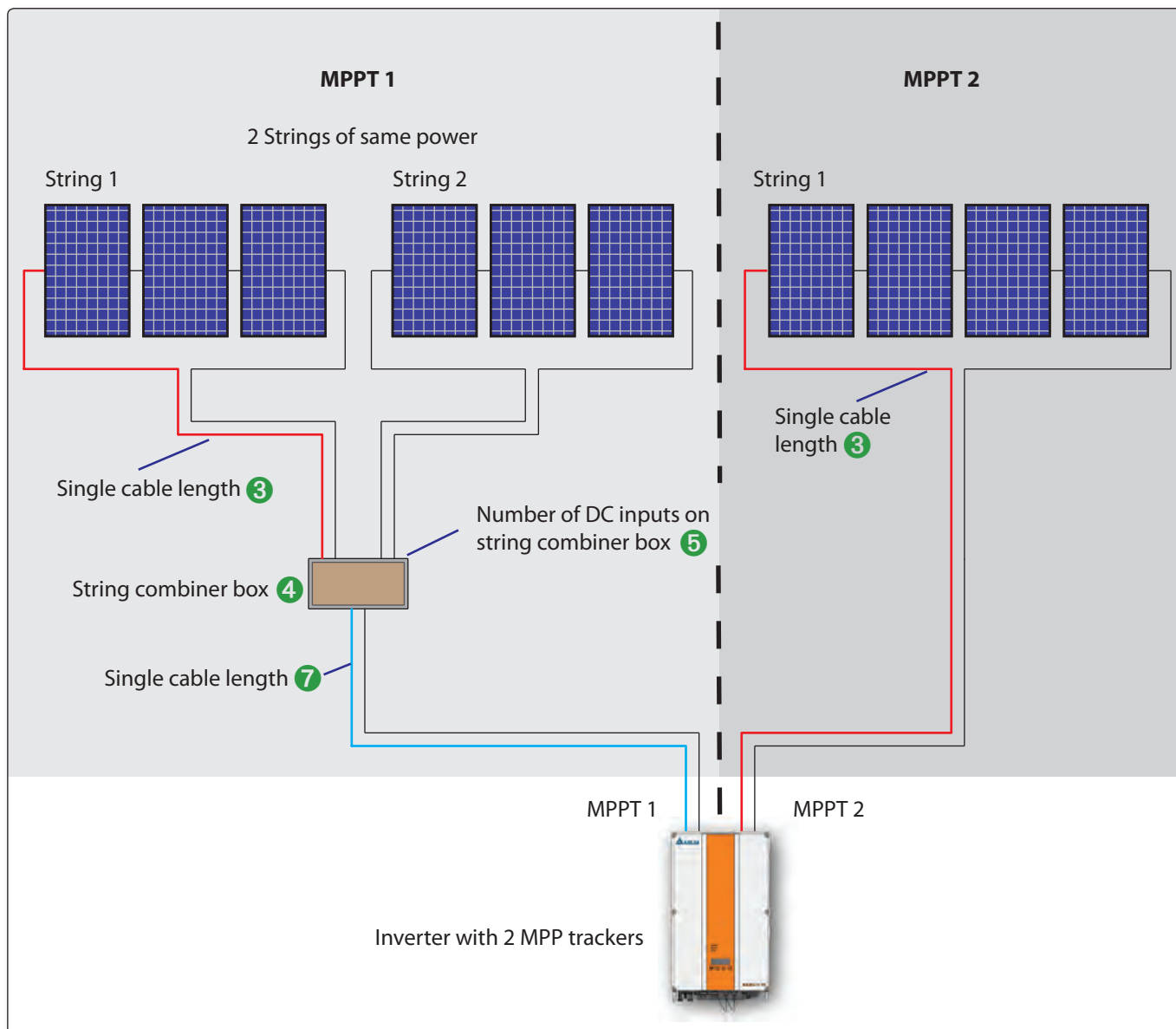


Fig. 8.10.: Example: Inverter with 2 MPP trackers, 1 string combiner box with several strings at MPPT 1; without string combiner box at MPPT 2

8.3 AC side

AC-Side

1

2

3

Inverter	Open phases	Phase mapping		
		L1	L2	L3
SOLIVIA 20 EU C0		1	1	1
SOLIVIA 5.0 EU 0		1	0	0
SOLIVIA 3.6 EU 0		0	1	1

4

Material/Cable cross section [mm²]:

Cu

6

5

Simple cable length [m]:

0

6

Power [kW]:

11.27

10.27

10.27

7

Voltage drop:

0 V

0 V

0 V

0 V

8

Unbalanced load:

1 kW

✓

9

Total AC cable loss:

0 W

0 %

✓

Number	Entry	Description
1	Inverter	The inverters that are used by the current system configuration.
2	Open phases	If it has not yet been established for an inverter in which phase it feeds, this is indicated as an open phase.
3	Phase mapping	Allocation of the single inverters to the phases. 3 phase inverters always feed in all 3 phases and distribute the load evenly.
4	Material/cable cross section [mm²]	Material and cable cross-section of the cable between string combiner box and inverter.
5	Single cable length [m]	Single cable length between inverter and grid connection point
6	Power [kW]	Fed power for every phase.
7	Current, voltage drop, power loss	Display of the values for each phase (L1, L2, L3) and the neutral conductor (N).
8	Unbalanced load	The maximum asymmetric load between two phases during normal operation.
9	Total AC cable loss	Total cable losses in watts and in percent.

Open phases, phase mapping

If the system configuration was performed using the system assistant, the inverters are automatically distributed to the phases.

The phase assignment can be changed manually.

Power [kW], unbalanced load

The power that is fed per phase. Changes in the phase assignment are immediately considered.



When assigning phases, observe the rules applicable in your country regarding asymmetric load balance.

- Activate the **Consider max. unbalanced AC load** option in the *System wizard* area. The problems with the asymmetric load are indicated (8 asymmetric load).

Total cable losses AC

If the cable losses are above 1 %, a yellow proclamation sign ⚠ is displayed.

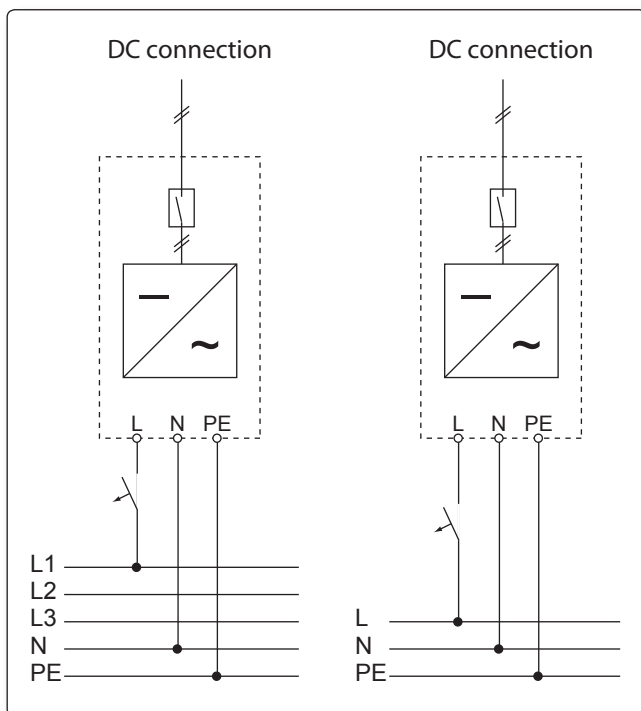


Fig. 8.11.: Connection of a 1-phase inverter to a 3-phase network (left) or 1 phase grid (right)

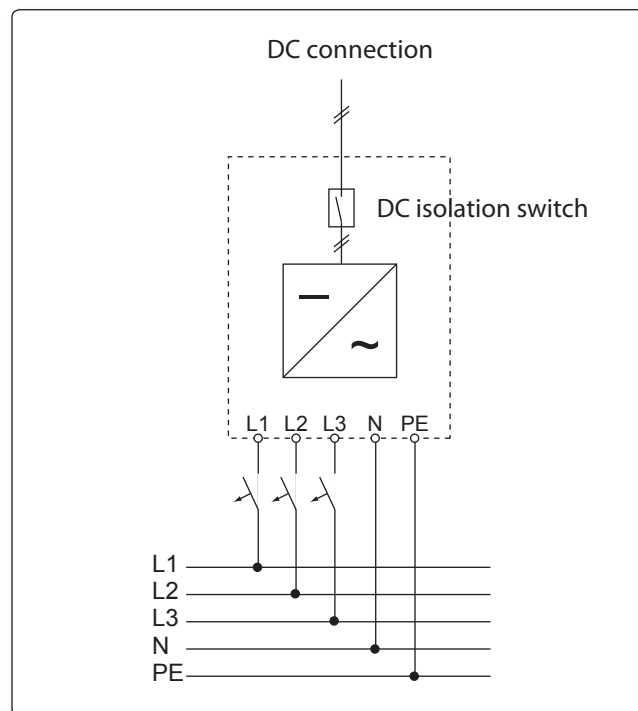


Fig. 8.12.: Connection of a 3-phase inverter to a 3-phase grid

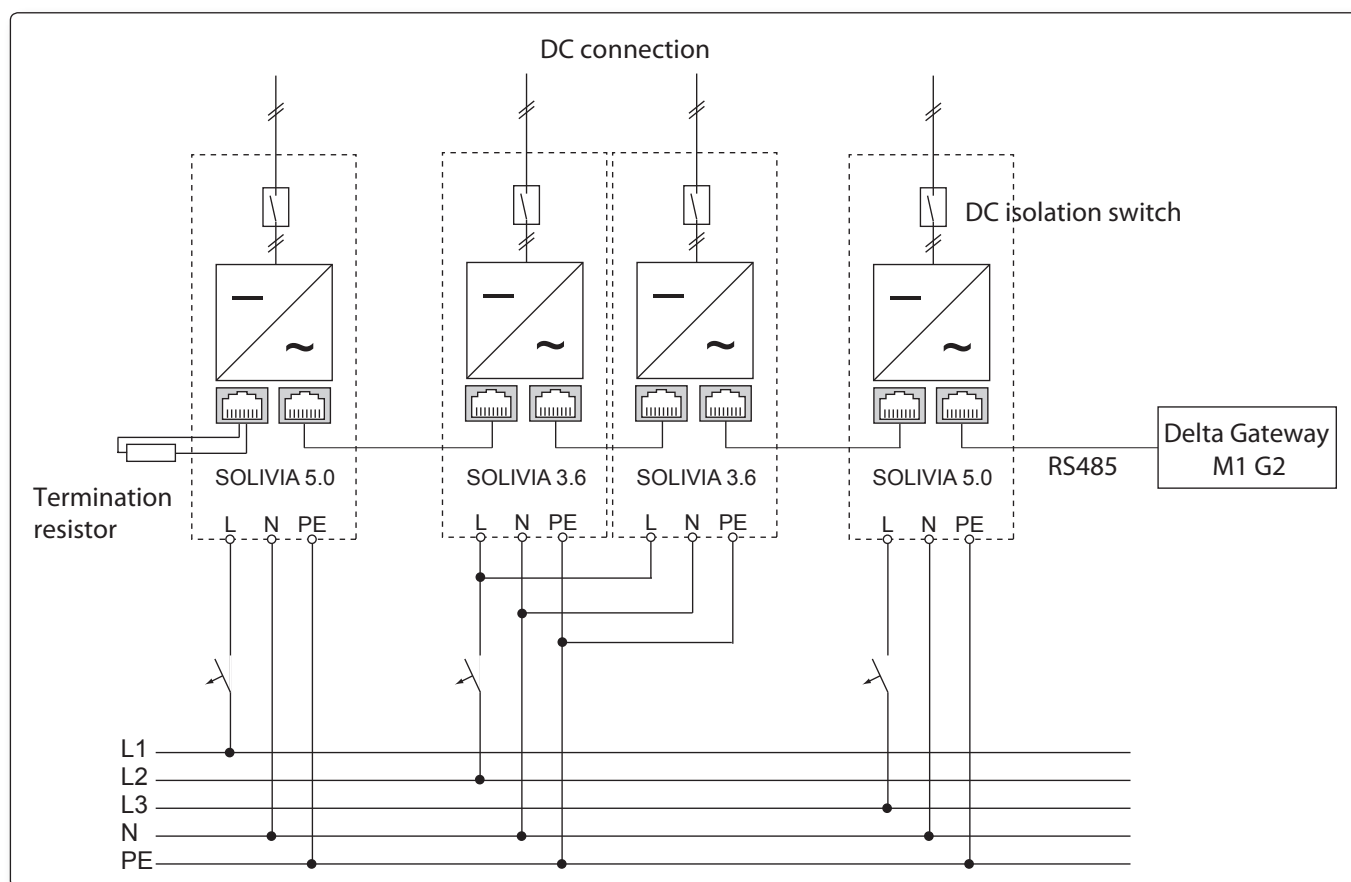


Fig. 8.13.: Connection of several 1-phase inverters to a 3-phase grid

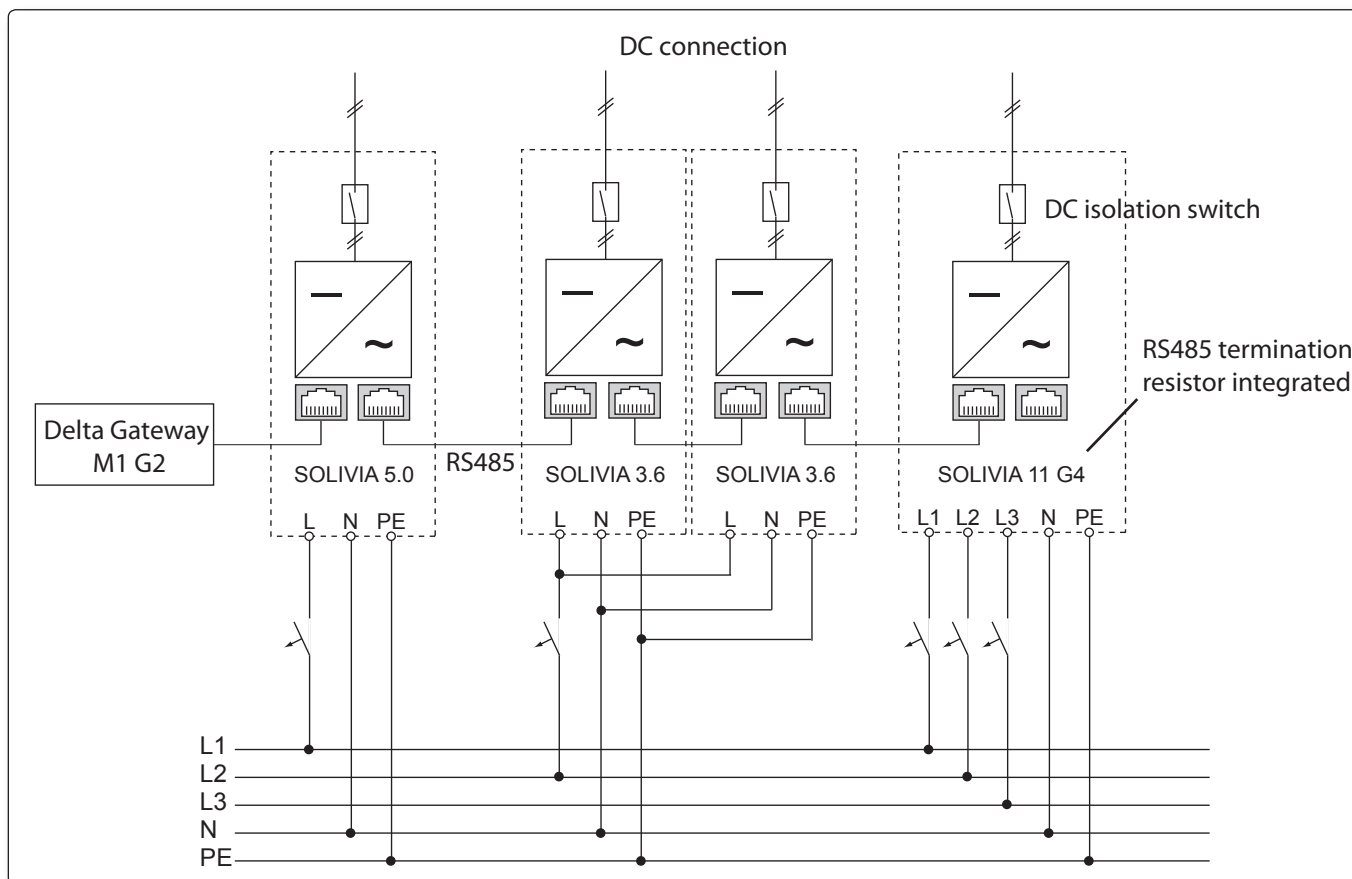


Fig. 8.14.: Connection of several 1-phase inverters and a 3-phase inverter to a 3 phase grid

! ATTENTION

When connecting several 1-phase inverters to the same phase in a 3 phase network:

- A Delta Gateway M1 G2 is needed to avoid a prohibited asymmetric grid load (e.g. in DE 4.6 kW) with an asymmetric phase failure (1 or 2 phases). The gateway regulates the power feed of the remaining phases down when there is an asymmetric phase failure. The gateway is connected to the RS485 interface of the inverter.



The 3-phase inverters (e.g. SOLIVIA 11 G4) have an integrated RS485 termination resistor that can be switched on and off.



The 3-phase inverter (e.g. SOLIVIA 11 G4) always distributes the power feeding evenly to all 3 phases. If there is an asymmetric phase failure, the 3-phase inverters switch off.

9. Result

Project selection		Location and customer data		System wizard		System configuration		Cable design		Result	
Personal data			Installation address			Configuration settings					
Full name Mrs.			Full name Mrs.			Min. Module temp. -10 °C					
Address			Address			Max. Module temp. 70 °C					
						Dimensioning temp. 25 °C					
						Irradiation 1000 W/m²					
						Region Europe					
						Grid voltage 230 V					
PV-Generator data						Inverter data					
Selected module(s): 51 x SM 230 M (230 Wp)						Selected inverter(s): 2 x SOLIVIA 3.6 EU G4 TR					
40 x D6M225B3A						1 x SOLIVIA 20 EU G4 TL					
45 x D6P225B3A						1 x SOLIVIA 5.0 EU G4 TR					
PV peak power: 30.88 kW						Total nominal AC power: 31.80 kVA					
Module count: 136											
PV-Generator total area: 225.88 m²											

In the *Result* area, all information for system configuration is clearly compiled. It is not possible to process the system configuration.

The result can be saved as PDF or exported in the XML format.

PDF is a widely distributed file format to present documents on the computer and for printing. The program Adobe® Reader™ is needed to present the PDF; this can be downloaded from the web page www.adobe.de (Downloads area).

The XML format enables the exchange of project data with other PV planners and the further processing in all programs that can process XML data.

9.1 Export project as XML

1. Click the link Export project as XML at the very bottom in the *Result* area.

→ A new dialog is opened.

2. Select a location to save the project and enter a name. Next click the **Save** button.

→ The project is saved as an XML in the specified folder (file name "<project name>.xml").

9.2 Save result as PDF

1. Click the **Save PDF** button.
→ The PDF is created and the dialog box *Save PDF* is displayed.
2. To save the PDF, click the **Save as a file** button.

→ A new dialog box is opened.

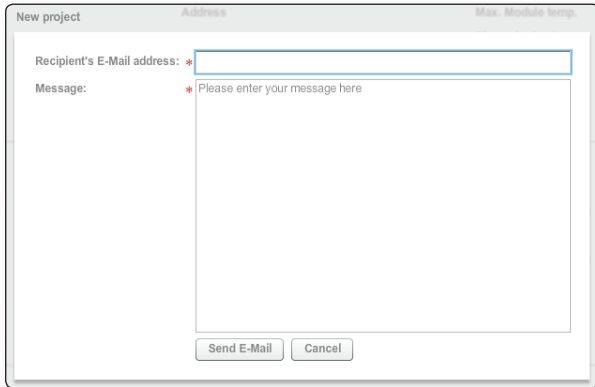
3. Enter the name for the PDF and select the directory in which the PDF is to be saved.

9.3 Send PDF as E-mail

The PDF can be sent as E-mail, without saving the PDF previously to the computer.

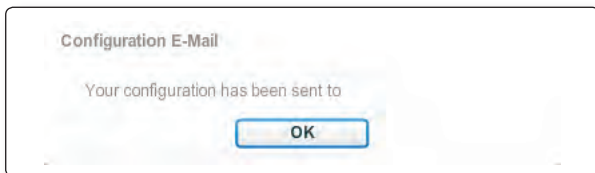
1. Click the **Send PDF as Email** button.

→ The *New project* dialog box opens.



2. Enter the E-mail address and a message and afterwards, click the **Send E-Mail** button.

→ After sending the E-mail, a confirmation appears.



10. Managing modules

10.1 Use standard modules

The PV Planner has an extensive database with standard modules.

- To select a standard module, click the **Select module** button in the *System wizard* or *System configuration* areas.



→ The *Select module* dialog box opens.



- In the *Public modules* tab, click a module and then on the **Accept** button.

→ The standard module is adopted into the system configuration.

Simplify module selection

Enter a search term into the **Module search** input field, e.g. the manufacturer name or the MPP power. The table is then filtered and only the modules which contain the search term are displayed.

If the same standard module is frequently used, it is possible to copy this standard module into the *Custom modules* tab. Then there is not necessary to search the entire table each time.

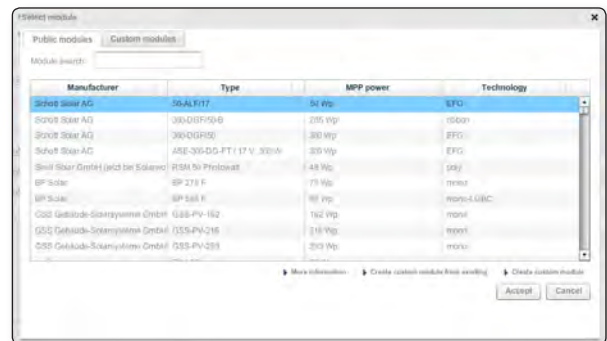
NOTE



- If you copy a standard module in the *Custom modules* tab, the module data is not updated when the database is updated.

Proceed as follows to copy a standard module:

- Click **module selection** in the dialog box, *standard module* tab on the module that is to be used as a template for the new module.



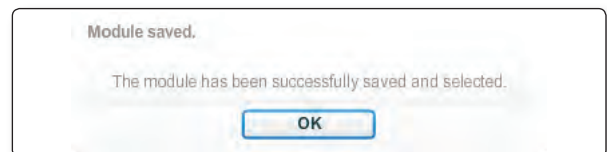
- Click the link **Create custom module from existing**.

→ The *Create customer-specific module* dialog box opens. The technical data of the standard module that served as a starting point is already entered.



- Enter a new name in the **Name** entry field, but otherwise do not change anything.
- After you have entered all data, click the **Save** button.

→ A confirmation message appears.



- Click the **OK** button.

→ The *system assistant* area opens. The module is automatically selected.

10.2 Create customer-specific modules

The database with the technical data for standard modules is huge. Despite this, it is possible that a module cannot be found.

In this case, you can create your own module.

There are two options:

- Create a new module based on a standard module. All technical data will be adopted from the standard module, and only the values that are different need to be changed.
- Create a new module from the ground up. All fields for the technical data are empty and all values must be entered.

The dialog to create a new module can be called up at the following locations in the PV Planner:

- Click the link [Create custom module](#) in the *System wizard* area.



→ The *Create custom module* dialog box opens.



- Click the **Select module** button in the *System wizard* or *System configuration* areas.



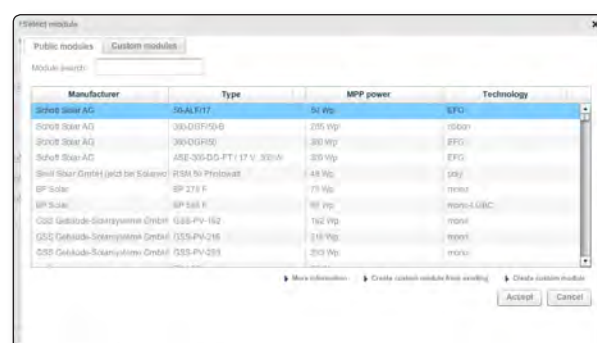
→ The *Select module* dialog box opens.

There is a [Create custom module from existing](#) link and a [Create custom module](#) link in the *Select module* dialog box.



Create a custom module based on a standard module.

1. In the *Select module* dialog box find the *Public modules* tab and click on the module that is to be used as a template for the new module.



2. Click the link [Create custom module from existing one](#).

→ The *Create custom module* dialog box opens. The technical data of the standard module that served as a starting point is already entered.

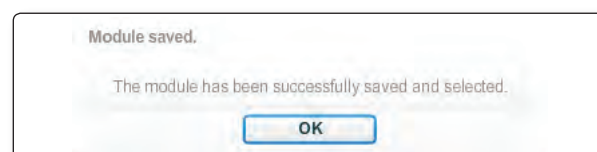


3. Change any data that differs in the new module from the standard module which served as a starting point.

The technical data that is identified by a red asterisk (*) **must** be filled in. Otherwise the new module cannot be saved.

4. After you have entered all data, click the **Save** button.

→ A confirmation message appears.



5. Click the **OK** button.

→ The *System wizard* area opens. The new module is automatically selected.

